uncertainty relations

commutator

$$[\hat{A}, \hat{B}] = i\hat{C}$$

uncertainty relation $\Delta A \, \Delta B \; \geq \; |\langle C \rangle|/2$

$$\sqrt{\langle \Psi | \hat{A}^2 | \Psi \rangle - \langle \Psi | \hat{A} | \Psi \rangle^2} \sqrt{\langle \Psi | \hat{B}^2 | \Psi \rangle - \langle \Psi | \hat{B} | \Psi \rangle^2} \geq \frac{1}{2} \left| \langle \Psi | [\hat{A}, \hat{B}] | \Psi \rangle \right|$$

variance

equality for states with $\hat{A}|\Psi\rangle = i\lambda \, \hat{B}|\Psi\rangle$